Suggestions for using this methodology to improve department practices

Since the 1980s, Six Sigma methodology has been applied in a growing number of companies. However, as with any tool of quality or methodology, it must be adapted by a maintenance department to successfully reach its individual goals. Initially, a work group's excellence level must be observed and verified before implementation. To achieve success with Six Sigma, basic day-to-day maintenance procedures and techniques have to be in place.

If a company believes that Six Sigma will bring success, it will be necessary to look for Black Belts or Green Belts (professional leaders who specialize in this methodology) for assistance. They will be capable of setting goals in Six Sigma, adapting it to specific needs, and obtaining sustainable results.

Quality tools and Six Sigma integration

Six Sigma does not create new tools but uses existing ones. The flow and sequence of these tools and statistical techniques is important in the search for excellence in products and services, for cost reductions, and, consequently, shareholders return.

The main methodologies of Six Sigma are Define, Measure, Analyze, Improve, Control (DMAIC) and Design for Six Sigma (DFSS). This article will deal with DMAIC applied to existing processes, as opposed to DFSS, which is used in the implementation of new products or services. It is important to use creativity to mold expectations about Six Sigma. The methodology is flexible and will not replace or diminish any technique or tool already used, but will add to them. This fear is common and must be prevented to avoid resistance that will destroy the program.

DMAIC in maintenance

To apply Six Sigma in maintenance, first find work groups that have a good understanding of preventive maintenance techniques in addition to a strong leadership commitment.

The methodology is divided into five distinct phases:

- Phase D (Define). Establish the objectives of the department and identify the critical-for-quality processes. In this phase, leaders, planners, maintenance staff, Black Belts,

and Green Belts need to work together to set departments goals. As there will be a large number of ideas, the first job of this team is to organize with the use of the Y=f (X) (where X represents the input of the process, Y the output of the process, and f the function of X). This is the most difficult stage because targets, problems, and goals may not be clear or easy to identify. It is a difficult job, and the team must remember that the steps for the next phase will be drawn from its initial work.

- Phase M (Measure). After teams choose the vital few of the trivial many, the indexes, data collection plan, and analysis method can be chosen. Some common indexes include frequency of preventive maintenance, frequency of predictive maintenance, productivity, number of corrective occurrences, maintenance costs, downtime, pulse survey, overall equipment effectiveness (OEE), etc.
- Phase A (Analyze). Teams will use analysis graphs (Pareto, scatter, run chart, box plots, etc.) to visualize trends and to search for root causes.
- Phase I (Improve). An action plan and failure mode and effects analysis (FMEA) can help in the action definition to improve the performance of the chosen indexes.
- Phase C (Control). Teams will outline a plan to retain the gains after the conclusion of the project. The finance department can assist in investment calculations, profits, ROI, etc.

Each problem raised can be dealt with individually as a project to be led by a Black Belt and Green Belt, or a macro approach can be used—whichever is the best way to get the best performance in the maintenance department. This work usually takes from 4-6 months.

What must be done

Some points are important for a healthy maintenance program:

- In the first months of Six Sigma deployment, everyone in the organization must be informed and involved. If only top management and operations participate and managers or supervisors are not involved completely, the program may fail.
- Roles and responsibilities should be clearly and absolutely defined.
- Compensation, career plans, and retention plans of those involved in the program must be defined. Keep in mind that you are preparing people with high potential who deserve special benefits.
- It is important to find the commonalities among distinct groups (quality control people, managers, supervisors, controllers, etc.).
- Targets need to be established and coherent goals set.
- A strong Black Belt and Green Belt selection process should be set up to search for the best talent in the company. Many managers fear losing their best professionals and tend to select the wrong candidates. The human resources part is important.
- A strong commitment from top leaders is essential.
- Extra programs should be developed as shadows or reverse mentoring so company leadership can be made aware of Black Belts and Green Belts.
- Future activities should be defined for Black Belts after the learning phase as they will be in a special position to influence the department structure.
- Support should be available for the jobs and projects. Green Belts assist Black Belts and

they do not work full time. Experience shows that not all trained Green Belts develop and complete projects. Remember that resources are being expended in the program and good results are expected.

- If the maintenance department is already involved in advanced techniques of maintenance (TPM, predictive maintenance, CMMS, etc.), it will be easier to apply Six Sigma as there is a good base from which to work.
- Departments that are led by managers or supervisors with no vision or goals are not environments that will stimulate the growth of the program. Culture change may be necessary.

- The maintenance department must be strategically located within the organization because it will be in the spotlight.
- Work groups need to be able to function independently and be results driven. The degree of specialization and job time sometimes works against new practices. Leaders must establish a way to become professionals.
- Finally, the most important thing is creativity. Projects, activities, methods, programs of quality, etc., in maintenance areas may not be well understood. Adaptation is the key for success.

Results

These results can be expected:

- Sustainable results in short and medium timeframes.
- Disciplined work groups.
- Autonomy of the maintenance professionals.
- Data driven maintenance.
- Optimized resources.
- Improved relationship between finance and operations.
- Increased financial return.
- High performance environment.
- Creativity support.
- World class maintenance. **MT**

Robson Quinello is maintenance planner and Black Belt at Ford Motor Co. Brasil in São Paulo; (5511) 9791-7209

What is Six Sigma?

According to Stan Grabill, a certified Six Sigma expert (Black Belt) writing for MAINTENANCE TECHNOLOGY's Viewpoint column, Six Sigma focuses on reducing variation in a business'

internal processes using a rigorously structured, statistical approach that is tied to business results.

Six Sigma for asset dependability reduces the variation in design, procurement, installation, operation, reliability, and maintainability of equipment assets in order to provide predictable performance at optimal cost of ownership.

Think of Six Sigma as root cause variation analysis—where a different set of tools is used to identify sources of variation and determine a means to mitigate “bad” variation and control “good” variation to enhance output productivity. The reason to do this highly structured methodology is to reap the business benefits of reducing variation, which results in break-through productivity improvements.